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REVIEW

Watchful waiting vs. early repair for asymptomatic and mildly symptomatic inguinal hernia – silent hernia, loud debate: a qualitative systematic review

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Abstract

Aim More than one-third of inguinal hernias are asymptomatic, and performing surgery in the absence or presence of mild symptoms remains a point of concern for many surgeons. This study aims to evaluate whether watchful waiting (WW) is a viable management strategy for asymptomatic and mildly symptomatic inguinal hernias by comparing its outcomes to early surgical repair. To broaden the scope of existing evidence, we included both recent randomized controlled trials and observational studies.

Material and methods PubMed, Cochrane Central, and EMBASE were searched for studies comparing early repair and WW in patients with asymptomatic or mildly symptomatic inguinal hernias. The primary outcomes assessed were the rate of crossover from WW to surgery, reasons for crossover, and the presence of pain in both groups. Secondary outcomes included quality of life (QoL) and hernia recurrence. A Kaplan–Meier failure function curve was constructed to estimate time from study enrollment to crossover.

Results Among 619 screened studies, 12 met the inclusion criteria, covering 1,755 patients (748 (42.6%) in early surgical intervention and 1,007 [57.4%] in the WW). Among WW patients, 477 (27.1%) eventually crossed over to surgery, with crossover rates ranging from 6.1% (Patti 2014) to 75.4% (Chung 2011). Approximately 50% of WW patients required surgery within five years. The most reported reason for crossover was pain (65%), followed by impaired quality of life (16%), bowel-related symptoms such as incarceration or strangulation (8.5%), hernia volume progression (3%), and other or unspecified causes (7.5%). Pain was the most consistent patient-specific predictor of crossover to surgery.

Conclusion WW appears to be a viable and safe approach with low complications rates for patients with asymptomatic inguinal hernias. However, long-term data show that approximately 50% of patients cross over to surgery within five years, and this proportion exceeds 96% by 12 years. Ultimately, the decision between WW and early surgical intervention should be guided by shared decision-making, considering patient values, symptom burden, comorbidities, and life expectancy.

Keywords Inguinal hernia · Watchful waiting · Systematic review

Abbreviations

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses	MeSH	Medical Subjects Heading
PROSPERO	Prospective Register of Systematic Reviews	WW	Watchful Waiting
ROBINS-I	Risk of Bias in Non-Randomised studies of Interventions	IH	Inguinal Hernia
		RR	Risk Ratio
		RCT	Randomized Controlled Trial

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BMI	Body Mass Index
VAS	Visual Analogue Scale
NRS	Numeric Rating Scale
PCS	Physical Component Score
QoL	Quality of Life

Introduction

Inguinal hernia (IH) is a prevalent condition, with over 800,000 surgeries performed annually [1]. The diagnosis of inguinal hernia has been rising in recent years, likely due to the increased use of imaging studies [2]. Surgeons are trained to surgically correct inguinal hernias, even in cases that are asymptomatic or mildly symptomatic, to prevent potential complications such as incarceration or strangulation. These complications can place patients at risk for emergency surgery, which may result in serious adverse outcomes [2, 3].

However, the necessity of surgery in asymptomatic patients remains a topic of debate, as the procedure itself could lead to postoperative chronic pain and, in addition, potentially avoidable complications and expenses [2, 4]. For this reason, watchful waiting (WW) has been considered as an alternative. Although the risk of acute complications in inguinal hernias is low, it remains important to acknowledge that such complications can still occur [5].

Given the significance of this condition and the ongoing debate about its optimal management, this study aims to evaluate whether early surgical intervention is necessary for these patients, or if a watchful waiting approach could be a viable option until symptoms become more pronounced, thereby requiring surgical correction.

Methods

This systematic review was performed in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) Statement and recommendations from Cochrane Collaboration Handbook for Systematic Reviews of Interventions [6]. Our research protocol was retrospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) on June 10, 2025 (ID CRD420251008561).

Eligibility criteria

We included studies that met all the following eligibility criteria: (1) observational, retrospective or prospective studies or randomized controlled trial studies; (2) patients aged>18 years old with asymptomatic or mildly symptomatic inguinal hernias. Mildly symptomatic inguinal hernia was defined as mild pain or discomfort due to the hernia when working and exercising that does not prevent a patient from performing his usual activities; (3) patients undergoing either WW or surgery – defined as elective hernia repair performed soon after diagnosis, using a tension-free technique. We excluded studies with any of the following conditions: (1) inappropriate study population (e.g., significant symptomatic inguinal hernias) or studies involving children/adolescents; (2) conference abstracts; or (3) systematic reviews, case reports, letter to the editors and case series.

Search strategy and data extraction

Two authors (E.F and T.S.) independently and systematically searched PubMed, Embase, Cochrane Library from inception to March 2025. The following terms were used without filters or publication date: ('inguinal hernia' OR 'hernia' OR 'herniorrhaphy') AND ('asymptomatic disease' OR 'watchful waiting'). References from all included studies and previous systematic reviews were also manually searched for additional studies. Any conflicts were resolved through consensus among the authors, with a third author (M.E.) involved in the decision-making process. Language restrictions were applied to English, Spanish and Portuguese, articles in languages other than these three were excluded from our analysis. Data extraction was performed by two authors (M.E. and T.S.) from the selected studies. When numerical data were not explicitly reported in the text or tables, values were extracted from graphs using WebPlotDigitizer (version v5; https://automeris.io/).

Endpoints

The primary outcome was the cumulative crossover rate to herniorrhaphy among patients initially managed with WW, as well as the reported reasons for crossover. Secondary outcomes included recurrence rates, pain levels, and quality of life comparisons between surgery and WW groups. Pain assessments were extracted either qualitatively—when described as the primary reason for crossover—or through standardized instruments such as the Visual Analogue Scale (VAS), Numeric Rating Scale (NRS), patient-reported ordinal scales (ranging from 1 to 4), or the Physical Component Score (PCS) of the SF-36 questionnaire. Extracted data included cohort characteristics (author, year of publication, country, study design); number of participants (total and by treatment arm); age and age cutoffs; body mass index (BMI); surgical approach; follow-up duration; hernia characteristics (unilateral or bilateral, primary or recurrent); pain assessments; intraoperative, perioperative, and postoperative complications; and mortality.

Quality assessment

We assessed the risk of bias in non-randomized studies using the Cochrane Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) [7] tool, rating each study as having low, moderate, serious, or critical risk of bias in 7 domains: confounding, selection of participants, classification of interventions, deviations from intended interventions, missing data, outcome measurement, and selection of the reported result. For randomized trials, we applied the Cochrane Risk of Bias 2 (ROB 2) [8] tool, which covers 5 domains: the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selection of the reported result. Each trial was classified as having low risk, some concerns, or high risk of bias. Two independent reviewers (E.F. and V.N.) conducted the evaluations following the recommendations from the Cochrane Handbook for Systematic Reviews of Interventions [9], and disagreements were resolved by consensus with a third reviewer (M.E.).

Statistical analysis

To assess the cumulative proportion of patients undergoing surgical repair over time, we generated a Kaplan–Meier failure function curve using aggregated patient-level data from the included studies. Survival time was defined as the number of years from study enrollment to crossover to surgery, with patients who did not undergo surgery by the last follow-up considered censored. The cumulative incidence of surgery was plotted as 1 – Kaplan–Meier survival probability (i.e., failure function). The curve includes 95% confidence intervals and displays the number of patients at risk at yearly intervals along the x-axis. The analysis was conducted using RStudio (version 4.2.2; R Foundation for Statistical Computing, Vienna, Austria).

Results

Study selection and baseline characteristics

The initial systematic search yielded 618 results, of which twelve studies met the inclusion criteria and were included in the analysis. The PRISMA flowchart is shown in Fig. 1. Of these studies, four were randomized controlled trials (RCTs), four were secondary analyses from a single study, three were long-term follow-ups of an original RCT, one was a retrospective study, and two were prospective studies. A total of 1,755 patients were included: 1,007 in the WW group and 748 in the surgical group. The mean age across studies ranged from 62.8 years (SD 13.5), with age cutoffs for inclusion ranging from 18 to 80 years. Most participants were male (97.4%, $n=1{,}709$), and only three studies included female patients, representing 2.6% ($n=46$) of the overall cohort. The most performed surgical technique was the Lichtenstein repair, followed by laparoscopic TAPP and TEP. The duration of follow-up varied from 6 to 108 months. The characteristics of the included studies are presented in Table 1.

Most patients had unilateral hernias: 90.1% in the WW group and 92.1% in the surgical group. Primary inguinal hernias were reported in 94.3% of patients in the WW group and 93.7% in the surgical group. Reporting of intraoperative and perioperative complications was inconsistent across studies. Postoperative complications were reported in three studies for the WW group, with rates ranging from 1.2% to 25%, and in four studies for the surgery group, ranging from 0% to 11.2%. Mortality secondary to inguinal hernia was reported in four studies. In the WW group, three studies reported no hernia-related deaths, while one study Aktimur et al. [10] reported a mortality rate of 5.4%, which the authors attributed to a distinct patient population characterized by advanced age (>80 years), significant comorbidities, delayed presentation, and the unavailability of local anesthesia. In the surgery group, three studies also reported zero hernia-related mortality, whereas one study O'Dwyer et al. [11] reported a mortality rate of 1.2%. These findings are summarized in Table 2.

Quality assessment

The overall risk of bias for the four randomized trials included two rated as low risk and two with some concerns, primarily related to the randomization process, deviations from intended interventions, or outcome measurement. Among the three non-randomized studies, one was judged to have a moderate overall risk of bias, while two were rated as having a critical risk. In both cases, the critical risk was essentially due to confounding factors that were not adequately addressed. The full risk of bias assessment is presented in Fig. 2.

Outcomes

Crossover rate

The primary outcome of this study was the rate of crossover from WW to surgical intervention. Crossover data were reported in seven studies. Among these, three were long-term follow-up analyses of previously published randomized controlled trials; therefore, data from the extended follow-up studies were extracted instead of their original RCT counterparts to better capture long-term outcomes.

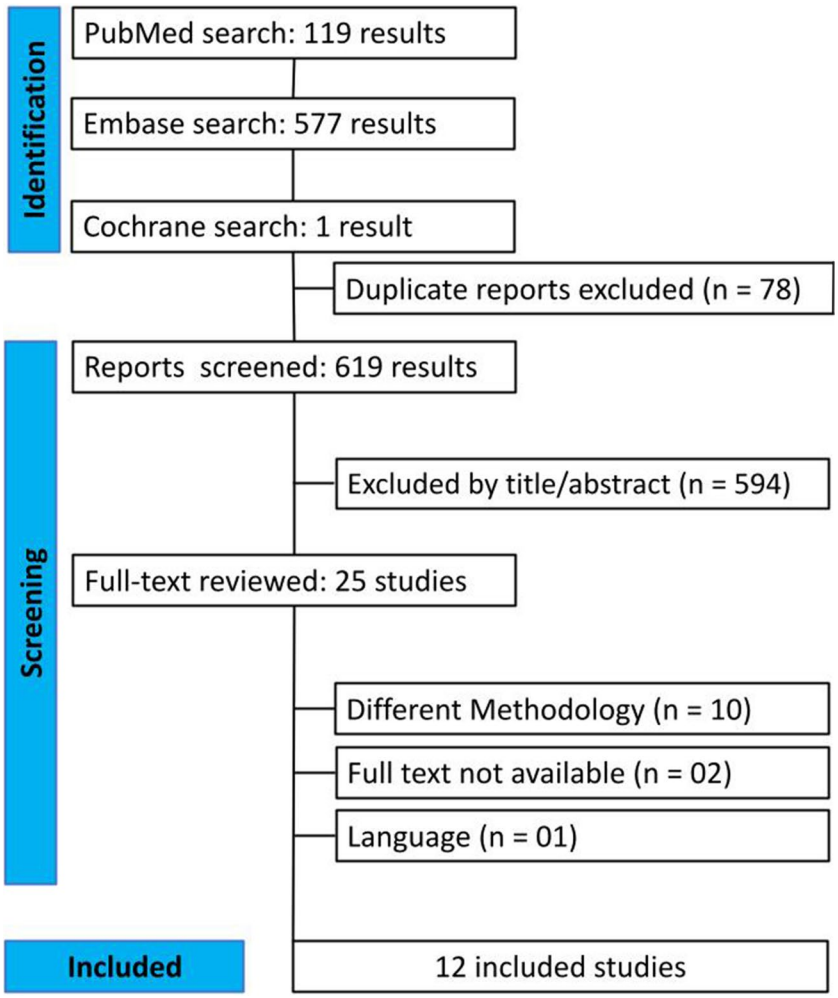

Fig. 1 PRISMA flow diagram of study screening and selection

Cumulative crossover rates were reported annually. One study Patti et al. [12] was excluded from the cumulative analysis due to its limited follow-up duration of only six months, which precluded inclusion in the annual analysis.

The cumulative proportion of patients undergoing surgery over time is illustrated in Fig. 3. At one year, approximately 14% of patients had crossed over to surgery, increasing to 24% by year two. By five years, around 50% of patients had undergone surgical intervention, and by year twelve, the cumulative crossover rate reached an estimated 96.3% among patients initially managed with watchful waiting.

The analysis included 894 patients at baseline in the Kaplan–Meier model, slightly fewer than the total 1007 patients originally assigned to the WW group. This discrepancy reflects incomplete or unreported time-to-event data in some studies, which limited their inclusion in the cumulative survival model. Over the follow-up period, the number at risk declined due to crossover and loss to follow-up (e.g., 598 at year 1, 308 at year 4, and 42 at year 12). The curve includes 95% confidence intervals, which remained relatively narrow throughout the follow-up period, indicating precision in the cumulative estimates.

A total of 477 crossover events were recorded from studies that reported reasons for surgery. Among these, the most common reason was pain (65%), followed by impaired quality of life (16%), bowel-related symptoms such as incarceration or strangulation (8.5%), hernia volume progression (3%), and other or unspecified causes (7.5%). These findings are summarized in Table 3.

Recurrence, pain, and quality of life

Three studies reported data on hernia recurrence (Fitzgibbons et al. [13], de Goede et al. 2017 [18], and Aktimur et al. [10]). The first two were RCTs, while the third was a retrospective observational study that primarily included elderly patients with distinct baseline characteristics. Due to methodological differences and population heterogeneity—particularly the inclusion of non-randomized data in only one study—only the two RCTs were deemed comparable. As a result, the available data were insufficient to support a robust pooled meta-analysis on recurrence, and findings were instead summarized narratively.

Table 1 Characteristics of the included studies

Cohort	References	Year	Country	Study Design	Total of Patients	Type of Intervention	Cutoff Age	Male % (*n*) Female % (*n*)	Age (mean, SD)	BMI kg/m^2 (mean, SD)	Surgery	Follow Up (months)	Aim / Outcomes
Aktimur [10]		2014	Turkey	Retrospective	154	WW and Surgery	≥80	83.8% (129) 16.2% (25)	83±2.8	24.8±4.6	Lichtenstein	15 months*	Crossover Rate; Crossover-related Morbidity / Mortality Predisposing factors for crossing over
Fitzgibbons	**Fitzgibbons** [13]	2006	USA / Canada	RCT	720	WW and Surgery	≥18	100% (720) Male	57.5±14	26.2±3.6	Lichtenstein	24 months	Pain / Discomfort Complications; Functional status; Activity; Satisfaction with Care
	Stroupe [23]	2006	USA / Canada	2nd analysis RCT	641	WW and Surgery	≥18	100% (641) Male	N/A	N/A	Lichtenstein	24 months	Pain Cost-Effectiveness
	Thompson [25]	2007	USA / Canada	2nd analysis RCT	353	WW and Surgery	≥18	100% (353) Male	57±13.9	26.5±3.6	Lichtenstein	24 months	Effect of Surgical Delay (>6 Months) on Short- and Long-Term Outcomes
	Sarosi [24]	2011	USA / Canada	2nd analysis RCT	366	WW	≥18	100% (366) Male	56.5±13.7	25.7±3.4	Lichtenstein	24 months	Characteristics that Predict Crossover to Surgery or Worsening of Hernia Symptoms
	Fitzgibbons [22]	2013	USA / Canada	Prospective	254	WW	≥18	100% (254) Male	56.4±13.8	26.3±3.6	Lichtenstein	108 months	Long Term Crossover Rate
O'Dwyer	**O'Dwyer** [11]	2006	UK	RCT	160	WW and Surgery	≥55	100% (160) Male	71.4±8	N/A	N/A	47.8 months*	Pain Cost to Health Crossover Rate
	Chung [4]	2011	UK	Prospective	118	WW and Surgery	≥55	100% (118) Male	82*	N/A	N/A	90 months*	Long Term Follow Up
de Goede	**de Goede** [18]	2017	Netherlands / Belgium	RCT	496	WW and Surgery	≥50	100% (496) Male	65.1±8.3	24.9±2.7	Laparoscopic TEP/TAPP Lichenstein	36 months	Pain QoL Event Free Survival Crossover Rate
	Van den Dop [15]	2023	Netherlands / Belgium	Retrospective	200 Φ	WW and Surgery	≥50	100% (200) Male	63.5±6.8	24.5±2.5	Laparoscopic TEP/TAPP Lichenstein	156 months*	Long Term Follow Up
Patti [12]		2014	Italy	Prospective	40	WW and Surgery	≥75	100% (40) Male	74.8±5.8	N/A	Lichtenstein	6 months	QoL
Sadava [14]		2022	Argentina	Prospective	100	WW	≥23	91% (91) 9% (9)	67	26.5	Laparoscopic TAPP Lichtenstein	51 months*	QoL Pain Crossover
Meuzelaar [16]		2025	Netherlands	RCT	85	WW and Surgery	≥41	85.9% (73) 14.1% (12)	58 (WW)* 54 (ETFR)*	26 (WW)* 27 (ETFR)*	Laparoscopic TEP	12 months	Pain QoL Patient Satisfaction Crossover rate

WW Watchful Waiting; *N/A* Not available;—not applicable; *QoL* Quality of Life

* Median; Φ Patients available for telephone follow-up

Table 2 Overview of patient characteristics and outcomes by treatment strategy (WW vs. Surgery)

	Watchful waiting (*N* = 1007)							Surgery (*N* = 748)						
	Aktimur [10]	Fitzgibbons [13]	O'Dwyer [11]	de Goede [18]	Patti [12]	Sadava [14]	Meuzelaar [16]	Aktimur [10]	Fitzgibbons [13]	O'Dwyer [11]	de Goede [18]	Patti [12]	Sadava [14]	Meuzelaar [16]
Total of Patients in Each Arm	137	364 (279)*	80	262	15	100	49	17	356 (294)*	80 (75)*	234	25	-	36
Number of Patients with Pain After Follow Up	N/A	17 (5.1%)	21 (28%)	N/A	N/A	N/A	N/A	N/A	7 (2.2%)	24 (30%)	N/A	0	N/A	N/A
Unilateral or Bilateral	U: 132 (96.4%) B: 5 (3.6%)	U: 311 (85.4%) B: 53 (14.6%)	U: 72 (90%) B: 8 (10%)	Excluded Bilateral Hernias	U: 13 (86.7%) B: 2 (13.3%)	U: 69 (69%) B: 31 (31%)	U: 100%	U: 15 (88.2%) B: 2 (11.8%)	U: 308 (86.5%) B: 48 (13.5%)	U: 75 (96%) B: 5 (6%)	Excluded Bilateral Hernias	U: 21 (84%) B: 4 (16%)	N/A	U: 100%
Primary / Recurrent	P: 137 (100%) R: 0	P: 321 (88.2%) R: 43 (11.8%)	P: 79 (99%) R: 1 (1%)	P: 249 (95%) R: 13 (5%)	Excluded Recurrent	N/A	Excluded Recurrent	P: 17 (100%) R: 0	P: 322 (90.4%) R: 34 (9.6%)	P: 77 (96%) R: 3 (4%)	P: 224 (95.7%) R: 10 (4.3%)	Excluded Recurrent	N/A	Excluded Recurrent
Loss of Follow Up	0	7 (2%)	0	N/A	0	0	1 (2%)	0	11 (3%)	0	N/A	0	-	1 (2.8%)
Intra/Peri-operative Complications	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	0	-	0
Post-operative Complications	19 (25.7%)	Hematoma 1 (1.2%)	N/A	N/A	N/A	12 (22%)	N/A	2 (11.7%)	N/A	0	N/A	0	-	0
Recurrence After Surgical Repair	3 (4%)	2 (2.3%)	N/A	5 (5%)	N/A	0	N/A	0	3 (1%)	N/A	7 (3.1%)	0	-	N/A
Mortality Secondary to Hernia	4 (5.4%)	0	0	N/A	0	N/A	N/A	0	0	1 (1.2%)	N/A	0	-	N/A
Mortality due to Other Reasons	N/A	12 (3.3%)	4 (5%)	8 (3.1%)	0	N/A	N/A	N/A	10 (2.8%)	5 (6.2%)	7 (3%)	0	-	N/A

N/A Not available;—not applicable

*Number of Patients Randomized (Number of Patients that Received the Intervention)

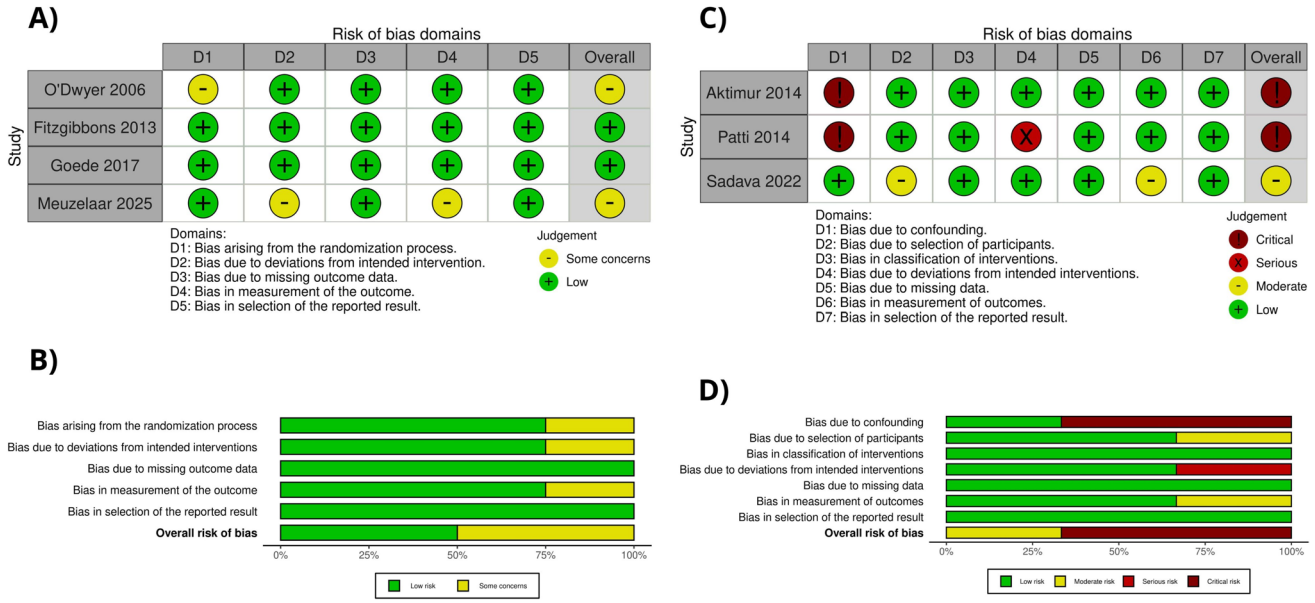

Fig. 2 ROBINS-I qualitative assessment of the studies: A. Traffic-light plot. B. Summary Plot; ROB 2: C. Traffic-light plot; D. Summary Plot

The Physical Component Score was reported in three studies (Fitzgibbons et al. [13], de Goede et al. 2017, and Patti et al. [12]). However, follow-up durations were inconsistent—6 months in Patti, 3 months and 1 to 3 years in de Goede, and 2 years in Fitzgibbons—contributing to considerable heterogeneity. Although the Physical Component Score is derived from four of the eight SF-36 domains, its calculation requires individual patient-level data, which were not available in the included studies. As only aggregate scores were reported, secondary Physical Component Score analyses could not be performed.

Regarding overall quality of life, five studies assessed this outcome. Two studies (O'Dwyer et al. [11] and Patti et al. [12]) reported all eight SF-36 components. Three studies used the EuroQoL-5D instrument; however, in one of them (Sadava et al., 2022), QoL was assessed only in patients who eventually crossed over to surgery, and not in those who remained in the watchful waiting group.

Due to the heterogeneity in both pain and QoL assessment methods, timepoints, and reporting formats, data could not be pooled, and a formal meta-analysis was not feasible.

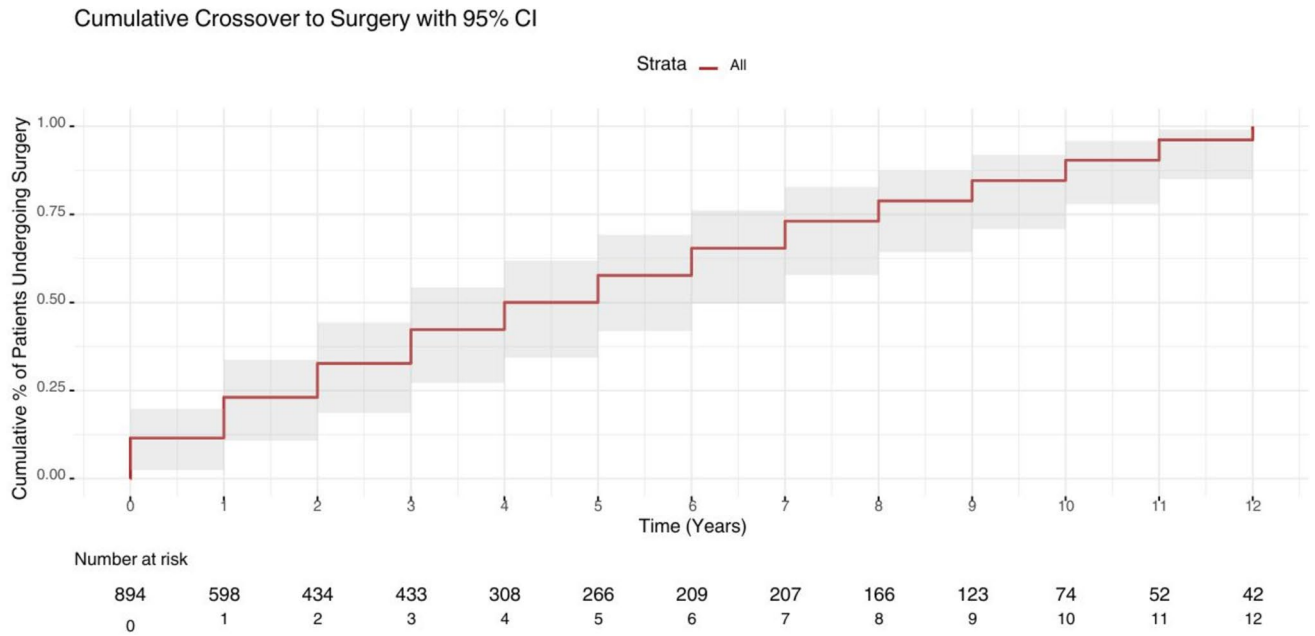

Fig. 3 Cumulative proportion of patients undergoing surgery

Table 3 Crossover rate and reasons for crossover

Cohort	Crossover rate % (*N* of Patients)	Reasons for CO
Aktimur [10]	54% (74)	66.2% Pain 33.8% Bowel Symptoms
Fitzgibbons [22]	55.5% (141)	54.1% Pain 3.3% Tired of having the hernia 2.4% Incarceration 4.1% Advised by doctor to have it repaired 0.8% Employer wanted hernia repaired 8.1% Other 30.9% Combination of reasons (including increased pain)
Chung [4]	75.4% (46)	71.7% Pain 10.9% Increase hernia size 13% Affecting QoL 4.4% Acute Hernia Repair
Von den Dop [15]	60.8% (157)	38.2% Increased pain 41.4% Increased discomfort 6.4% Incarceration 13.4% Other reason
Patti [12]	6.6% (1)	6.7% Strangulation
Sadava [14]	53% (53)	90.5% Pain 9.5% Volume Augmentation
Meuzelaar [16]	10.2% (5)	20% Persisting Complaints 80% Palpable Inguinal Hernia during Physical Examination

Discussion

Our study comprised a pooled cohort of 1,755 patients, with 1,007 managed under WW and 748 undergoing surgical repairs. The vast majority of participants were male (97.4%). Based on pooled Kaplan–Meier data, approximately 50% of patients initially assigned to WW crossed over to surgical repair within 5 years, and this proportion increased to over 96% with extended follow-up up to 12 years. The most common reason for crossover was the development or worsening of pain, highlighting pain as the primary driver for eventual surgical intervention.

When comparing patients randomized to WW versus surgery, O'Dwyer et al. [11] observed a greater improvement in general health among those who underwent early surgical intervention, which aligns with the results of Patti et al. [12], which in their cohort, patients who underwent prompt herniorrhaphy experienced improvements across all eight domains of the SF-36 questionnaire [11, 14]. de Goede et al. (2017) also reported better QoL outcomes in the surgical group, although, they concluded that the differences were too small to be considered clinically meaningful and remained inconclusive regarding pain or discomfort after 24 months of follow-up [15]. Notably, Meuzelaar et al. [16] found that while pain scores favored surgery at three months, differences in both pain and QoL were no longer evident at the 12-month follow-up. Still, due to the premature termination of the study during the COVID-19 pandemic, the required sample size was not achieved, warranting cautious interpretation of these findings [17]. Despite these findings, a formal meta-analysis of recurrence, pain, and quality of life (QoL) outcomes was not feasible due to substantial heterogeneity in study design (RCTs vs retrospective observational), patient population, assessment tools, follow-up periods, and reporting methods across studies.

One of the major concerns with recommending the WW approach is the risk of acute hernia complications (e.g., incarceration or strangulation), as emergency surgery is associated with a mortality rate up to ten times higher than elective repair [10, 18–20]. In our analysis, six studies reported acute operations among patients who crossed over to surgical repair. Of all reported reasons for crossover, 8.5% occur due to acute presentations — consistent with the estimated 5–10% rate of emergency repair in the general population with inguinal hernias [21]. Importantly, three of the four studies in our review that reported mortality outcomes documented no deaths. The only exception was Aktimur et al. [10], which included frail elderly patients (≥80 years) with a high burden of comorbidities [10]. Among the three long-term RCTs, no deaths were attributed to hernia complications. Additionally, these trials were conducted in the US, UK, and Netherlands, suggesting that outcomes may differ significantly when extrapolated to rural or low-resource environments, where access to timely surgical care is often limited [12, 18, 22]. Finally, it is essential to highlight that these findings are based on a predominantly male population—97.4% (1,709/1,755) of patients were men, and only three studies included female participants. As such, the generalizability of these results to women is severely limited, and the safety and effectiveness of the WW approach in female patients with inguinal hernias remain unknown.

From a socioeconomic perspective, Stroupe et al. [23] reported that patients undergoing early herniorrhaphy had more hospitalization days than those managed with WW during the initial 6 months of follow-up. This trend persisted after 2 years, with patients from the surgical group incurring a higher average total cost compared to WW patients ($7,875 vs. $6,044), resulting in an incremental cost of $1,831. Despite the higher costs, prompt surgical repair was associated with a modest increase in quality-adjusted life years (QALY). While a cost per QALY of approximately $50,000 is commonly cited as a threshold for determining whether a medical intervention is cost-effective, the probability that surgical intervention met this threshold was only 40%, suggesting a 60% chance that it was not cost-effective by conventional standards over the 2-year period [23]. Similarly, O'Dwyer et al. evaluated cost-effectiveness and found that there was no significant QALY gain at 12 months. They

noted that early IH repair may not appear cost-effective in the short term, but its value could increase with longer follow-up, potentially favoring surgical intervention over time [11].

Beyond the cost-effectiveness considerations reported in prior studies, our pooled analysis demonstrated that the WW approach avoided surgery in 50% of patients within the first five years. Identifying patient-specific factors that predict CO to surgery could better guide shared decision-making in this population. Sarosi et al. [24] investigated baseline characteristics associated with an increased likelihood of crossover [24]. They found that pain during strenuous activity at baseline was the strongest predictor of failure of WW. Additional factors associated with higher crossover rates included chronic constipation, prostatism (hypothesized to reflect increased straining during defecation or urination), being married (speculated to increase caregiver burden in the WW approach), and being ASA I. The authors suggested that healthier patients might be more inclined to opt for surgery due to lower perceived surgical risk [24]. Similarly, Aktimur et al. [10] emphasized that older adults may hesitate to undergo elective procedures due to poorer general health and a higher burden of comorbidities [10]. Fitzgibbons et al. (2013) found that patients aged 65 years or older had a higher risk of crossover compared to younger patients (79.3% vs. 62% after 10 years) [22]. Lastly, Van den Dop et al. [15] reported that patients with mildly symptomatic IH were not only more likely to cross over than those who were asymptomatic, but also did so earlier, with 50% crossing over within the first two years [12].These findings suggest that pain may be a factor influencing surgical decision-making. [13].

Our data demonstrate that patients who present to a doctor due to symptoms of IH should be counseled about their high likelihood of eventually requiring surgery [12, 22]. Early IH repair may offer benefits in select patients, as crossover is often due to pain progression, and studies suggested improvements in pain, QoL, and QALY with surgical approach [6, 8, 11–13, 15]. For elderly patients, careful consideration should be given to life expectancy. If the patient is likely to live beyond 5 to 10 years, early herniorrhaphy may reduce future surgical risk, as delayed interventions at an advanced age are associated with higher rates of postoperative complications [18, 20]. However, it is also important to recognize that older individuals may derive less improvement in QoL from surgery compared to younger, more active patients, making individualized risk–benefit assessment essential [12].

It is important to acknowledge the limitations inherent to our study. Substantial heterogeneity in study design, patient populations, and outcome measurements limited our ability to perform formal comparisons across studies. Although our pooled cohort included 1,755 patients, only 477 (27.1%) were reported as having crossed over to surgery, making it difficult to perform a robust analysis of predictors of crossover. Furthermore, two non-randomized studies in our analysis, Aktimur et al. [10] and Patti et al. [12], were judged to have a critical overall risk of bias in the first domain of the ROBINS-I tool, due to confounding. These limitations compromise the internal validity of both studies, as the observed improvements in the surgical groups may partly reflect baseline differences in health status, symptom perception, or functional capacity, rather than the true effect of the intervention alone. Therefore, while our findings suggest meaningful trends, definitive conclusions could not be drawn. Lastly, the study population was overwhelmingly male, the applicability of these findings to women remains uncertain.

Conclusion

WW can be a viable and safe approach with low complications rates for male patients with asymptomatic and mildly symptomatic inguinal hernias. However, most patients ultimately progress to surgery over time—approximately 50% within five years, and over 96% by twelve years. Patients who experience pain during physical activity appear to have a higher likelihood of crossover to surgery, and early elective repair may be more appropriate in this subgroup. Therefore, the decision between WW and early surgical intervention should be guided by shared decision-making, considering patient values, symptom burden, comorbidities, and life expectancy. Due to substantial heterogeneity in study design, populations, and outcome reporting, definitive conclusions could not be drawn, and generalizability to female patients remains limited. All data analyzed during this study are included in this published article.

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Declarations

Ethical approval Our research protocol was retrospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) on June 10, 2025 (ID CRD420251008561).

Informed consent Not applicable.

Conflicts of interest The authors declare no conflict of interest.

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